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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,149	09/22/2003	Yoshiki Nishibayashi	50212-540	8724
7590 07/28/2005 MCDERMOTT, WILL & EMERY 600 13th Street, N.W. Washington, DC 20005-3096			EXAMINER COLON, GERMAN	
			ART UNIT 2879	PAPER NUMBER

DATE MAILED: 07/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/667,149

Applicant(s)

NISHIBAYASHI ET AL.

Examiner

German Colón

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3 and 7 is/are allowed.
- 6) ☒ Claim(s) 1, 6 and 8 is/are rejected.
- 7) ☒ Claim(s) 2, 4 and 5 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>092203</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishibayashi et al. (US 2002/0031913) in view of Shiomi et al. (US 5,844,252).

Regarding claim 1, Nishibayashi discloses an electron emission element comprising (see at least Fig. 2): a substrate **21** and a protrusion **30** protruding from the substrate and including boron-doped diamond (see paragraph [0054], line 6):

the protrusion comprising a columnar body **36**; and

a tip portion of the protrusion comprising an acicular body **32** sticking out therefrom.

Nishibayashi discloses values for the distance *r* between a center axis and a side face in the columnar body (see at least Fig. 12) but is silent regarding the concentration of boron in the boron-doped diamond.

However, in the same field of endeavor, Shiomi discloses a boron-doped diamond electron-emission element and teaches said boron concentration to be greater than $1 \times 10^{17} \text{ cm}^{-3}$, and preferably greater than $1 \times 10^{18} \text{ cm}^{-3}$ in order to obtain an increased emission current, an increased current gain and increased withstand voltage of the electron devices (see at least Col. 2, lines 8-11; and Col. 3, lines 1-8). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the boron concentration disclosed by

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Shiomi to the boron-doped diamond of Nishibayashi, with the purpose of obtaining an increased emission current, an increased current gain and increased withstand voltage of the electron devices.

The Examiner notes that Shiomi discloses the boron concentration in terms of the nitrogen concentration, resulting in the boron concentration mentioned above. Also, the Examiner notes that Nishibayashi in view of Shiomi discloses the distance r satisfying the formula: $r > 10^4 / \sqrt{Nb}$ (see '913, Fig. 12, in view of '252, Col. 3, lines 1-8).

Regarding claim 6, Nishibayashi discloses the protrusion protruding from a (111) sector of a diamond (see paragraph [0050], lines 10-12). The Examiner notes that the method of making the protrusion, i.e. by a high pressure-high temperature synthesis, is not germane to the issue of patentability of the device itself. Accordingly, this limitation has not been given any patentable weight.

Referring to claim 8, Nishibayashi discloses the substrate comprising diamond (see paragraph [0043], lines 4-5). The Examiner notes that the method of making the diamond, i.e. by a vapor-phase synthesis, is not germane to the issue of patentability of the device itself. Accordingly, this limitation has not been given any patentable weight.

Allowable Subject Matter

3. Claims 3 and 7 are allowed.
4. Claims 2 and 4-5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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5. The following is a statement of reasons for the indication of allowable subject matter:

Referring to claim 2, the references of the Prior Art of Record fail to teach or suggest the combination of the limitations as set forth in claim 2, and specifically comprising the limitations of “the distance r being 0.1 μm or less; and the boron concentration in the diamond being $5 \times 10^{19} \text{ cm}^{-3}$ or more”.

Referring to claim 3, the references of the Prior Art of Record fail to teach or suggest the combination of the limitations as set forth in claim 3, and specifically comprising the limitation of “the diamond crystal included in the tip portion of the protrusion being terminated with hydrogen”.

Regarding claims 4-5, the references of the Prior Art of Record fail to teach or suggest the combination of the limitations as set forth in the claims, and specifically comprising the limitation of “the boron concentration in the diamond being higher than the nitrogen concentration”.

Claim 7 is allowable for its dependency status from claim 3.

Prior Art of Record

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Saito et al. (US 6,184,611) and Jones (US 5,583,393) disclose emitters comprising diamond. Brandes et al. (US 6,268,229) discloses doped emitter tips. Song (US 6,069,018) and Geis et al. (5,728,435) disclose doped emitters comprising a columnar body and a tip portion.

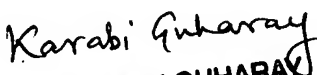
Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to German Colón whose telephone number is 571-272-2451. The examiner can normally be reached on Monday thru Thursday, from 8:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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KARABI GUHARAY
PRIMARY EXAMINER